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Ecosystem-Based Management Action Plan

Overview

The U.S. Commission on Ocean Policy offers the following definition of ecosystem-based management (EBM):

> "Ecosystem-based management looks at all the links among living and non-living resources, rather than considering single issues in isolation. This system of management considers human activities, their benefits, and their potential impacts within the context of the broader biological and physical environment. Instead of developing a management plan for one issue (such as a commercial fishery or an individual source of pollution), ecosystem-based management focuses on the multiple activities occurring within specific areas that are defined by ecosystem, rather than political, boundaries."

The approach put forth by the Commission is entirely consistent with the policies and purposes of the National Marine Sanctuaries Act (NMSA). The NMSA provides authority to the National Marine Sanctuaries "for comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner which complements existing regulatory authorities…" The NMSA directs the sanctuary to "maintain the natural biological communities in the national marine sanctuaries, and to protect, and, where appropriate, restore and enhance natural habitats, populations, and ecological processes;…", as well as, "create models of, and incentives for, ways to conserve and manage these areas, including the application of innovative management techniques;…", while at the same time "facilitating uses to the extent compatible with the primary purpose of resource protection…"

This Action Plan strives to adopt this approach by detailing a series of actions that will lay the foundation for effective ecosystem-based management.

Description of the Issues

The public comment scoping process conducted by the Stellwagen Bank National Marine Sanctuary (SBNMS) in 1998, and again in 2002, identified several concerns relative to the need for comprehensive ecosystem protection and conservation of biological diversity at the SBNMS. Issues raised during public scoping were summarized as follows:

- Need for comprehensive ecosystem protection
- Zoning in the SBNMS including no-take zones
- EBM practices
- Boundary Modification

This Action Plan addresses these public issues comprehensively.

Issue Statement

EBM arose in the late 20th century to address the pervasive scientific uncertainty inherent in natural systems and the failures of single species management approaches to adequately address that uncertainty. The concept of an ecosystem, on which any discussion of EBM depends, can be defined as a biological community together with its associated physical environment. In the context of the marine environment, this would include all marine organisms including humans as well as the physical properties of the water column and the seafloor.

As the sanctuary is not an ecosystem unto itself but rather part of the much larger Gulf of Maine (GOM) ecosystem, the application of EBM to the SBNMS can be approached along two parallel tracks. First, the application of EBM at the SBNMS will involve the intensive collaboration with other regional agencies charged with managing components of the ecosystem beyond the sanctuary boundaries. Second, for management within the sanctuary boundaries, the guiding principles of EBM can be used in an EBM approach where an obvious sub-set of the larger GOM ecosystem is being managed.

There are no comprehensive EBM plans in the southern GOM at this time. The SBNMS currently regulates the mining of sand and gravel, disturbance of the seafloor (with the exception of fishing activity), and dumping of waste material within its boundaries. Fisheries management in the Federal waters of the region is conducted on a species by species basis. Similarly, even though the National Oceanic Atmospheric Administration (NOAA) Fisheries Atlantic Large Whale Take Reduction Team has grouped a number of large cetaceans under its auspices, the Marine Mammal Protection Act is enforced on a species by species basis.

Working Group

In order to address these issues the Sanctuary Advisory Council (SAC) convened an EBM Working Group (WG) composed of 19 members representing a cross-section of stakeholders. The EBMWG met seven times over a 9 month period and developed three alternative scenarios (A-C) representing a range of protection for the group's consideration. The EBM WG decided to focus on crafting a compromise action plan (around scenario B) which ultimately the group came to consensus on. This Action Plan is the consensus document. Scenarios A and C are included as appendices to this document for reference.

Goal Statement

The EBM WG considered the many definitions of EBM within the context of the sanctuary's situation and came to consensus on the following definition and goal:

> *Ecosystem-Based Sanctuary Management (EBSM) integrates knowledge of ecological interrelationships to manage impacts within sanctuary boundaries. The general goal of EBSM is to protect the ecological integrity of the SBNMS while recognizing that the sanctuary is nested within GOM large marine ecosystem. Effective implementation of EBSM should: (1) consider ecological processes that operate both inside and outside sanctuary boundaries, (2)*

recognize the importance of species and habitat diversity, and (3) accommodate human uses and associated benefits within the context of conservation requirements.

Objectives

The objectives of this plan are to:

- Comply with the purposes and policies of the NMSA
- Understand ecosystem structure and function
- Recognize the interconnectedness with the larger ecosystem
- Recognize our uncertainty of how ecological systems function
- Manage adaptively
- Maintain public accessibility to SBNMS
- Achieve environmental sustainability of sanctuary resources
- Maintain and enhance biological diversity and ecological integrity
- Reduce habitat impacts by users
- Establish a process for creating a zoning scheme

Addressing the Issues – Strategies for this Action Plan

The EBM WG developed the following research and management strategies to begin implementing EBM and establishing the infrastructure and framework for its continued development. Measures to evaluate the performance of strategies and their associated activities are listed at the end of each strategy/activity group.

There are six Strategies in the EBM Action Plan:

- EBM.1 – Establish a Research Steering Committee
- EBM.2 – Establish a Collaborative Research Consortium
- EBM.3 – Establish an Information Management Program
- EBM.4 – Understand Ecosystem Structure and Function
- EBM.5 – Protect Ecological Integrity
- EBM.6 – Evaluate the Need and Feasibility for Modifying the Sanctuary Boundary

Each strategy is detailed below.

STRATEGY EBM.1 – ESTABLISH A RESEARCH STEERING COMMITTEE

Strategy Summary

The committee should be a WG of the SAC that will assist in developing a research and monitoring plan for the SBNMS, recommending parameters for monitoring that are easily measurable and can serve as biological reference points, and developing an operational and quantifiable definition of ecological integrity.

Strategy Performance Measure: Research steering committee is established by SAC within 1 year.

Activities (1)

(1.1) *Establish a steering committee.*
The SAC must establish the steering committee as a WG so that outside members can participate.

Status: Completed by year 1.

Potential Members: SBNMS staff, New England Fishery Management Council (NEFMC) staff, NOAA Fisheries Northeast Fisheries Science Center (NEFSC) staff, academia, fishing industry, conservation organizations.

STRATEGY EBM.2 – ESTABLISH A COLLABORATIVE RESEARCH CONSORTIUM

Strategy Summary

The consortium shall be composed of academic, government, fishermen, and private interests who seek to understand how the sanctuary functions. The consortium is a more informal body than the steering committee and its purpose is to further the knowledge of the sanctuary system by fostering collaborative research between users and researchers on topics such as marine mammal acoustics, prey dynamics, oceanography, water quality changes, fish movement, etc.

Activities (2)

(2.1) *Convene sanctuary science symposium.*
The science coordinator shall organize a symposium on sanctuary science for the purpose of laying the foundation for a consortium and identifying the high priority issues that need to be investigated. This may become a biannual symposium the objective of which is to share knowledge with the SAC, SBNMS staff and other interested parties.

Status: Completed by year 1.

Potential Partners: Researchers, managers, academia, public.

(2.2) *Initiate consortium.*
The science coordinator shall initiate the consortium through email/listserve and a website specifically designed to foster the sharing of ideas and posting of results.

Status: Completed by year 2.

Potential Partners: Researchers, managers, academia, public.

STRATEGY EBM.3 – ESTABLISH AN INFORMATION MANAGEMENT PROGRAM

Strategy Summary

Using SBNMS' existing infrastructure capacity with outside software expertise, the sanctuary will develop a system with which to integrate, process, synthesize, and analyze scientific data. To maximize the utility of such a system, the user should be able to connect across the system for individual querying of all available data sets. The system will be made available for practical application on both an intuitive and expert level.

The objective of this system is to develop a well-designed information management and dissemination tool to facilitate science-based management. The system is designed to be widely applicable and accessible to SBNMS staff, scientists, decision makers, and the public. By setting up a database on an in-house server, SBNMS can expand the range and uses of existing data. Additionally, any user will be able to bring in a database, upload it into the sanctuary's system, and carry out any type of data analysis or processing from statistical analysis to support for management decisions.

Strategy Performance Measure: Information management system with public access shall be operational within 3 years.

Activities (7)

(3.1) *Establish quality assurance/quality control program.*
This program will ensure the integrity and quality of the data from the moment it is collected to the point at which it is archived.

Status: Completed by year 1.

Potential Partners: Internal.

(3.2) *Establish proprietary use policy.*
This policy will accord researchers sole rights to the data for a set time period after data collection to give them the first opportunity to publish. The policy should be modeled after the one used for the Global Ocean Ecosystems Dynamics (GLOBEC) program.

Status: Completed by year 1.

Potential Partners: Researchers.

(3.3) *Establish a full-time data manager.*
A full-time data manager is needed to administer this program.

Status: Completed by year 1.

Potential Partners: Internal.

(3.4) *Design an information management system.*
An information management system shall be designed that meets specified requirements related to data input, data access by various users, metadata, analysis, etc.

Status: Completed by year 1.

Potential Partners: Contractors, researchers, educators.

(3.5) *Implement an information management system.*
The information management system will be implemented first for internal use by SBNMS staff and then for access by the public.

Status: Completed by year 1.

Potential Partners: Contractors.

(3.6) *Process existing data.*
Databases maintained by the SBNMS or that SBNMS has access to will be processed and made available for analysis.

Status: Completed by year 2.

Potential Partners: Research steering committee.

(3.7) *Design and implement a web portal for public access to databases.*
The sanctuary has an obligation to make the data it collects or pays for accessible to the public within a reasonable timeframe. A web portal shall be designed that enables this access while maintaining the security of the NOAA network.

Status: Completed by year 3.

Potential Partners: Researchers, managers, academia, educators, public.

STRATEGY EBM.4 – UNDERSTAND ECOSYSTEM STRUCTURE AND FUNCTION

Strategy Summary

Ecosystem structure refers to how the components of an ecosystem are arranged, both horizontally and vertically. Ecosystem function refers to the processes that structure the ecosystem such as predation, succession, reproduction, and competition. The purpose of this strategy is to understand what components make up the sanctuary ecosystem and what processes influence the arrangement of the components.

Strategy Performance Measures:

1. Draft operational definition of ecological integrity by year 1.
2. Appropriate measures of biodiversity selected by year 1.
3. Trend analysis of suite of indicator species shall be analyzed by year 3 and completed thereafter on an annual basis.
4. Nutrient loadings in the sanctuary from local and far-field sources shall be quantified by year 5.
5. The dispersal rate and trajectories of model larvae under various environmental conditions shall be quantified by year 3.
6. The movement rates and distances of cod and redfish over gravel and boulder habitats during all seasons shall be quantified by year 4.
7. Real-time oceanographic and meteorological data shall be provided via the web for at least two locations within the SBNMS by year 5.
8. Benthic habitats in the entire sanctuary shall be mapped at a scale of 1:60,000 or better by year 5.

Activities (14)

(4.1) *Develop an operational definition of ecological integrity.*
Ecological integrity is a term that is location and scale dependent. It is both an intuitive and a technical term. While ecological integrity has not yet been defined for the SBNMS various definitions point to the notion of maintaining the wholeness of an ecosystem, or portion thereof, such that the system's native diversity and functioning are likely to persist. The objective of this activity is to develop an operational definition of ecological integrity that can be evaluated and monitored over time.

Status: Draft operational definition and metrics for measuring ecological integrity by year 1.

Potential Partners: Proposed research steering committee, proposed consortium, fishermen, other users.

(4.2) *Develop appropriate measures of diversity and those processes that mediate patterns of diversity.*
There are various ways to measure biological diversity and the processes that contribute to it. This activity is aimed at evaluating various measures and determining which ones most appropriately reveal the effectiveness of management actions.

Status: Completed by year 1.

Potential Partners: Proposed research steering committee, proposed consortium, academia.

(4.3) *Establish a biological and physical monitoring program.*
This program shall discern changes in the natural systems of the sanctuary. This program shall develop a comprehensive understanding of changes in ecosystem status. One objective of this

monitoring program shall be to determine the efficacy of any zones that are implemented in the sanctuary.

Status: Initiated by year 2.

Potential Partners: Proposed research steering committee, proposed consortium, Massachusetts Fishermen's Partnership (MFP) Fishermen's Initiative for Scientific Habitat and Ecosystem Research (FISHER), other users.

(4.4) *Establish an improved human use monitoring program.*
This requirement is necessary in order to fully understand the level of usage in the sanctuary, the socioeconomic impacts of regulations, the spatial and temporal distribution of usage, and the usage adjacent to currently closed areas. The program should provide adequate spatial resolution to confidently reconstruct the spatial distribution of human impacts with statistical confidence relative to habitat. Such activities could include automated information systems (AIS), vessel monitoring systems (VMS), radar, and refinement of vessel trip reports (VTR) and call in system. These activities will be implemented in consultation with the NEFMC, NOAA Fisheries, U.S. Coast Guard (USCG), citizens and other concerned parties.

Status: Initiated by year 1.

Potential Partners: NEFMC, NOAA Fisheries, USCG, citizens, other concerned parties.

(4.5) *Establish a directed research program.*
This program shall complement the monitoring program by investigating ecological processes that explain the patterns identified from monitoring. The research steering committee should advise on the questions to be answered.

Status: Initiated by year 2.

Potential Partners: Research steering committee, consortium, fishermen, other users.

(4.6) *Establish collaborative research programs with the recreational and commercial fishing industries to help answer specific questions about the ecology of the sanctuary and its use.* Examples would include the Northeast Consortium (NEC) and the MFP FISHER within the SBNMS.

Status: Initiated by year 2.

Potential Partners: MFP, NEC, regional nongovernmental organizations (NGO's), NEFMC, NOAA Cooperative Research Partners Initiative (CRPI), universities.

(4.7) *Develop a dynamic ecosystem model linking patterns of diversity with ecological processes.* An initial product of this effort will be a static conceptual model showing functional relationships between species. The research steering committee will then review the model and make recommendations to SBNMS.

Status: Initiated by year 2.

Potential Partners: Proposed research steering committee, academia, contractors.

(4.8) *Classify and map benthic habitats.*
The SBNMS currently has high resolution multibeam imagery of the entire SBNMS. However, benthic habitats have not been classified or mapped based on the multibeam data and groundtruthing data (e.g., video, sediment sampling and other means). These data would greatly facilitate planning and resource management efforts.

Status: Completed by year 4.

Potential Partners: U.S. Geological Survey (USGS), proposed consortium, academia, MFP.

(4.9) *Understand movements of organisms over landscape features.*
Understand movements of organisms relative to sanctuary seascapes and movement between the sanctuary and surrounding waters. Complete ongoing research, including cooperative research, to tag and track Atlantic cod and expand the research to include other species.

Status: Ongoing.

Potential Partners: Proposed consortium, contractors, academia, MFP, fishermen.

(4.10) *Understand the effects of natural disturbance (e.g., storm and tidal events, predation) on seafloor habitats.*

Status: Ongoing.

Potential Partners: Proposed consortium, contractors, academia, MFP, fishermen.

(4.11) *Develop predictive larval recruitment, dispersal, and connectivity models.*
Models shall include sources, sinks, larval concentrations, and larval behaviors using data from various sources.

Status: Initiated by year 2.

Potential Partners: Academia, state and federal agencies.

(4.12) *Develop an internal oceanographic circulation model.*
This model will interface with other models and will tie together local, regional, and larger-scale patterns. Development of this model is essential to understand and predict egg and larval transport, and the fate and effect of nutrients and pollutants.

Status: Completed by year 3.

Potential Partners: Academia, GOM Ocean Observing System (GOMOOS).

(4.13) *Quantify pollutant loadings.*
The importance of natural and anthropogenic nutrient and other pollutant loadings to sanctuary waters, including flora and fauna, from local, sub-regional (Mass Bay), regional (GOM), and global sources shall be quantified.

Status: Completed by year 5.
Potential Partners: Academia, Massachusetts Water Resources Authority (MWRA), USGS.

(4.14) *Establish an integrated ocean observing system.*
This system shall collect real-time data at multiple depths on oceanographic and biological parameters identified to aid in ecosystem based management. The system could be a subset of the GOMOOS and would be implemented with a combination of surface buoys and seafloor sensors.

Status: Completed by year 5.

Potential Partners: GOMOOS, academia, fishermen, shippers.

STRATEGY EBM.5 – PROTECT ECOLOGICAL INTEGRITY

Strategy Summary

The primary goal of EBM is to protect the ecological integrity of the sanctuary. No one action is sufficient to protect the integrity of the system short of making the sanctuary a wilderness area. The purpose of this strategy is to implement a set of complementary actions that will ensure the integrity of the ecosystem.

Strategy Performance Measures:

1. Provide recommendations to the SAC on a zoning scheme by year 2.
2. Request that the NEFMC and NOAA Fisheries take action to prohibit the taking of sand eels in the SBNMS by year 1.
3. The level of bycatch in the SBNMS will be assessed by year 3.
4. The trophic importance of forage species will be assessed by year 4.

Activities (4)

(5.1) *Establish a zoning WG to evaluate the adequacy of existing zoning schemes in SBNMS to satisfy the scientific requirements and meet the goals of EBSM and if needed, develop a modified zoning scheme (including a consideration of fully protected reserves) to meet those goals and requirements.*
The zoning WG shall be established by the SAC at its November 2004 meeting for the purpose of reviewing and evaluating data and information as it becomes available through various venues

(e.g., Omnibus Essential Fish Habitat process, sanctuary efforts) and making a recommendation to the SAC and ultimately to the sanctuary superintendent. The membership of the zoning WG shall be of representative stakeholder groups similar to the EBM WG. The zoning WG shall begin meeting in January 2005 in order to efficiently utilize the time that the final management plan is in preparation.

The zoning WG shall develop metrics for zone performance based on the objectives of the various zones as determined by the WG. These metrics shall form the foundation of a monitoring program designed to determine the efficacy of the zoning scheme and recommend any needed changes to accomplish the goals of the zoning scheme and EBSM.

The zoning WG shall make recommendations to the SBNMS regarding the zoning scheme within two years of the implementation of the final management plan as defined by the publication date for the Federal Register Notice notifying the public of the availability of the final management plan.

Status: Completed by year 2.

Potential Partners: Representative stakeholders.

(5.2) *Recommend implementation of a permanent ban on the exploitation of sand eels (Ammodytes spp.) within the SBNMS.*
Sand eels are an important forage species for baleen whales, groundfish, and pelagic fish and are an important component of the food web of the SBNMS and are currently unexploited. This activity will be implemented by the NEFMC and NOAA Fisheries at the request of the SBNMS.

Status: Initiate request by year 1.

Potential Partners: NEFMC, NOAA Fisheries, Atlantic States Fisheries Management Council (ASFMC).

(5.3) *Assess and minimize bycatch and discard.*
Bycatch of target and non-target species shall be minimized in the SBNMS. This activity will be implemented by the NEFMC.

Status: Completed by year 3.

Potential Partners: NEFMC, NOAA Fisheries, ASFMC.

(5.4) *Evaluate the need and ability to protect an adequate forage base for species within the sanctuary.*
Forage species such as Atlantic and river herring, squid, sand lance, and mackerel are an essential trophic resource for larger fishes, marine mammals and birds.

Status: Completed by year 4.

Potential Partners: NEFMC, NOAA Fisheries, MFP FISHER.

STRATEGY EBM.6 – EVALUATE THE NEED AND FEASIBILITY FOR MODIFYING THE SANCTUARY BOUNDARY.

Strategy Summary

This strategy is intended to evaluate the need for and feasibility of modifying the SBNMS boundary to include more of Jeffrey's Ledge. Jeffrey's Ledge may be an important habitat and resource area for characteristic species of the sanctuary. If results indicate that a change in the boundary is warranted, action should be taken by the SAC and the SBNMS to modify the sanctuary boundaries to include more of Jeffrey's Ledge.

Strategy Performance Measures:

1. Characterize the ecology and socioeconomics of Jeffrey's Ledge by year 5.
2. Understand the ecological relationship of Jeffrey's Ledge with the SBNMS by year 5.

Status: Completed by year 5.

Potential Partners: NEFMC, NOAA Fisheries, USCG, Whale Center of New England (WCNE), Center for Coastal Studies (CCS), stakeholders.

CONSIDERATIONS

The EBM WG acknowledges that the following activities are important components of EBM and should be considered in an EBM plan.

- Assess the extent of invasive species.
- Eliminate ballast water exchange.
- Enforce existing watershed protection measures.
- Assess speed restrictions.
- Mitigate impacts from pipelines, cables, and conduits.

However, the EBM WG recognizes that other WGs with more appropriate expertise have dealt with these issues in detail. Therefore, the EBM WG merely forwards them to the SAC for incorporation into a comprehensive EBM plan.